6.5.2	***Institution has adopted the following for Quality assurance:*** ***1. Academic and Administrative Audit (AAA) and follow up action taken*** ***2.Conferences, Seminars, Workshops on quality conducted*** ***3. Collaborative quality initiatives with other institution(s)*** ***4.Orientation programme on quality issues for teachers and students*** ***5. Participation in NIRF and other recognized ranking like Shanghai Ranking, QS Ranking Times Ranking etc*** ***6.Any other quality audit recognized by state, national or international agencies***

6. Any other quality audit recognized by state, national or international agencies

Energy Audit Report

Year – 2022-23

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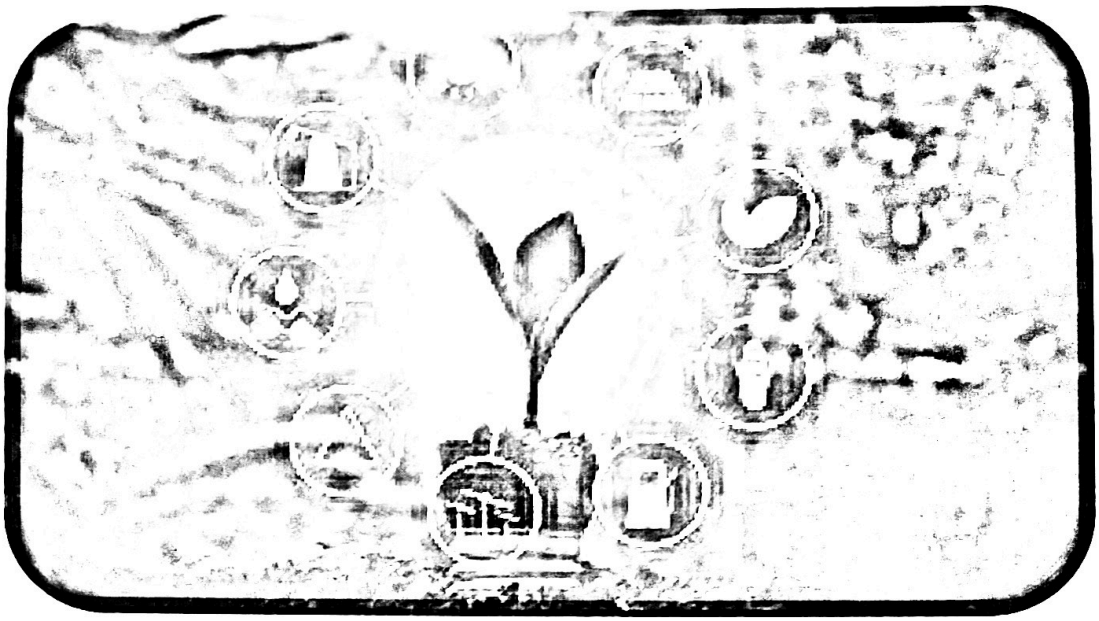
ENERGY AUDIT REPORT



Atmiya University

Yogidham Gurukul, Kalawad Road,
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Gujarat, India

Date: 14/04/2023

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Acknowledgement

An energy audit is to identify energy-saving opportunities. It helps to understand energy usage and ways to use energy better. Conducting a routine energy audit ensures reduction in carbon foot print and continuing to be energy efficient by continuously employing new energy conservation techniques.

We are thankful to Hon. P P Shri Tyagvallabh Swamiji for giving opportunities to conduct Energy audit of various facilitates at Atmiya university campus.

This report is made with sincere efforts and gives details of relevant data collected during energy audit study, observation, analysis and recommendations made pertaining to different facilities in campus.

Several energy conservation measures have been identified and proposed in course of study and these options when implemented are expected to bring in lasting benefits in term of energy saving as well as cost saving to the management.

Research, Innovation and Translation cell is willing to support the management technically toward implementation of energy saving measures for deriving energy conservation and cost effective benefits.

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Dr. A. M. Kothari
Director – Research, Innovation & Translation
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1. About the Organization

Sarvoday Kelavani Samaj is a non government, non-profit organization, established in 1963 that works primarily in the domain of Education. It is spread in 23 acre land, situated at Rajkot city, Gujarat, India. The aim of Sarvoday Kelavani Samaj is to cultivate a new generation that is capable of creating a difference for the better future. Sarvoday Kelavani Samaj managed an autonomous Atmiya group of institutions. Later, Sarvoday Kelavani Samaj established Atmiya University in 2018 under Gujarat Private Universities Act, 2018.

2. Introduction

Energy audit is a comprehensive assessment which an in-depth analysis of energy consumption patterns, identifies potential areas for improvement and offers recommendations to enhance energy efficiency, reduce cost and minimize environmental impact.Prime objective of energy audit is to reduce the amount of energy used in the organization without compromising theoutput. The audit includes suggestions on alternative means and methods for achieving energy savings to a greater extend. In general, energy auditing and management ofenergy consumption is to offer goods or services at the lowest possible cost and with the least amount of environmental effects.

3. Need for an Energy Audit

The need for energy auditarises from the importance of energy efficiency and sustainability in today's world. Energy audit serves several purposes and provides numerous benefits, including:

a. Identifying energy conservation opportunities by analyzing energy use and identifying areas where energy is being wasted or inefficiently used.
b. Cost reduction: Energy cost represents a significant part of total cost for any organization. An energy audit helps to identify energy-saving measures that can lead to cost reductions by reducing energy waste, optimizing equipment performance, and improving operational efficiency.
c. Environmental Sustainability: Energy consumption is closely linked to environmental impact, particularly in terms of greenhouse gas emissions and climate change. By conducting an energy audit, organizations can identify ways to reduce their carbon footprint and contribute to environmental sustainability goals.
d. Compliance with Regulations and Standards: By proactively addressing compliance issues, organizations can avoid penalties and maintain a positive reputation.
e. Energy Management and Planning: An energy audit provides valuable data and insights that enable organizations to develop comprehensive energy management plans.

4. Aims and objective of energy audit

The aim of an energy audit is to identify the energy efficiency, conservation and

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savings opportunities at the premises of the audit sites in as systematic manner. The audit process is carried out with the following objectives.

a. Review of energy saving opportunities and measures implemented in the auditsites.
b. Identification of additional various energy conservation measures and savingopportunities.
c. Implementation of alternative energy resources for energy saving opportunities and decision making in the field of energy management.
d. Providing technical information on how to build an energy balance as well as guidance to be sought for particular applications.
e. Detailed analysis on the calculation of energy consumption, analysis of latest electricity bill of the campus, understanding the tariff plan provided by state electricity board.

5. Energy Audit Methodology

The audit involves visiting physical position of load and carry out inventory of load. Due measurement of electrical load of equipment and circuit is carried out. Energy bill received from PGVCL is audited and studied for kWh requirement and how efficiently energy is used. Various positions are interacted, familiarized with energy audit and involved for successful and result oriented energy audit. Energy conservation and saving opportunities are identified for implementation.

6. Systems studied during Energy Audit

a. Lighting fixtures have been physically in various campuses verified and recorded.
b. Reviewed implemented non-conventional energy installation and applications in university for use.
c. Electricity bills served by PGVCL are verified and worked out for cost of power.
d. It is reviewed about Awareness program if any for optimum use of electricity and water as well as its saving undertaken at the university level. There is tremendous scope to create awareness among user about efficient andoptimum use of energy and water to save. Instruction cum Request Sign board shall be displayed near eachswitch-board and toilet block to influence andto guide user to arrest misuse and wastage of power and water.

7. Statistical Data& Observations

Atmiya Campus is educational organization and it uses majorly electricity as input energy source for application of various university activities. The electricity is procured from PGVCL by HT connection of 900 kVA. PGVCL serves monthly electricity bill for payment & on receipt of monthly electricity bill it is paid. Standby power source DG set of (625+320) kVA is available to use during power failure from PGVCL.

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A) Average Cost of Power

Monthly electricity bill is served by PGVCL against electricity used & is paid by university. A cost of power is worked out from total kWh used & their amount.

Table 1: Average cost of power

Sr. No.	Month of billing	Grid electricity consumed (kWh)	Grid electricity cost(INR)	Effective Unit energy cost (INR).
1	April-22	1,31,681	11,35,373	8.62
2	May-22	1,38,424	12,01,141	8.68
3	June-22	1,39,783	12,49,675	8.94
4	July-22	1,54,323	13,68,851	8.87
5	Aug-22	1,46,969	13,30,354	9.05
6	Sept-22	1,46,065	13,25,749	9.08
7	Oct-22	1,55,375	13,77,529	8.87
8	Nov-22	91,664	8,92,473	9.74
9	Dec-22	95,057	9,20,935	9.69
10	Jan-23	76,331	7,83,885	10.27
11	Feb-23	71,931	7,54,715	10.49
12	March-23	99,575	9,81,430	9.86

Effective Average cost of energy is Rs. 9.35per unit. In the month of November, December 22 and January, February, March23, unit energy cost is more than average value as maximum actual demand is quite lesser than 85% of contract demand.

B) Total % of LED Lighting Load in Total Lighting Load:

Table 2: % of LED lighting

Particulars	Total lighting requirement	Lighting requirement met by LED lights	Lighting through other type of lamp
Load (kW)	37.087	35.487	1.6
Annual Consumption (kWh)	66,756.6	63,876	2,880

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C) % of Annual power met by RE resources:

Table 3: Annual power met by RE resources

Source of renewable energy	Solar roof top generation (kWh)	Grid electricity consumption (kWh)	Total electricity consumption (kWh)	% of renewable energy
Solar Rooftop	**3,72,250**	14,47,178	18,19,428	**20.46%**

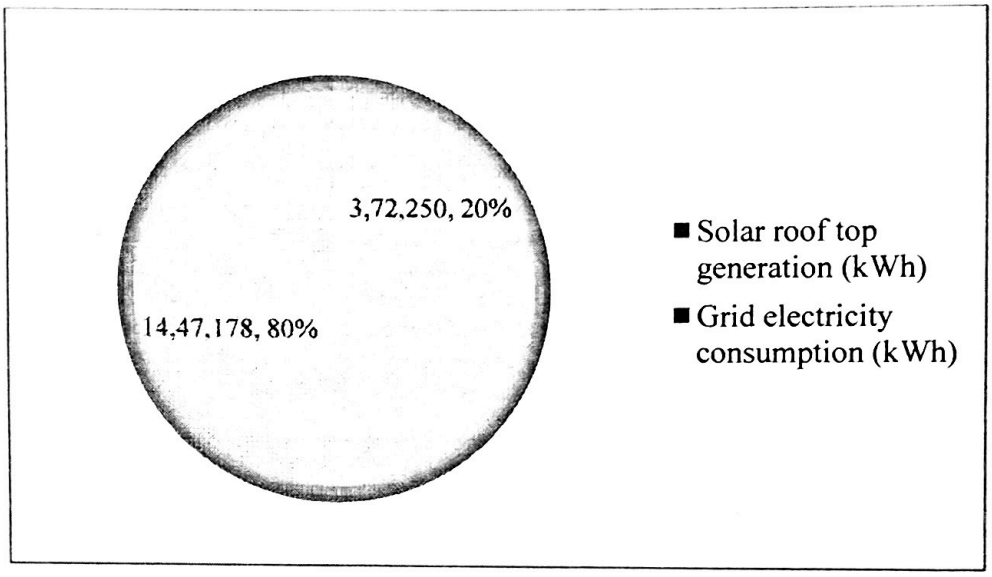

Fig. 1: % of Annual power met by RE resources

D) Green energy application per year and CO_2 Emission reduction

Table 4: CO_2 Emission reduction

Total annual energy requirement (kWh)	18,19,428
Total application of the green energy(kWh)	**3,72,250**
% on total requirement	**20.46%**
Estimated CO_2green house gas emission reduction per year (Ton)	**266.531**

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E) Solar PV Power generation and cost saving

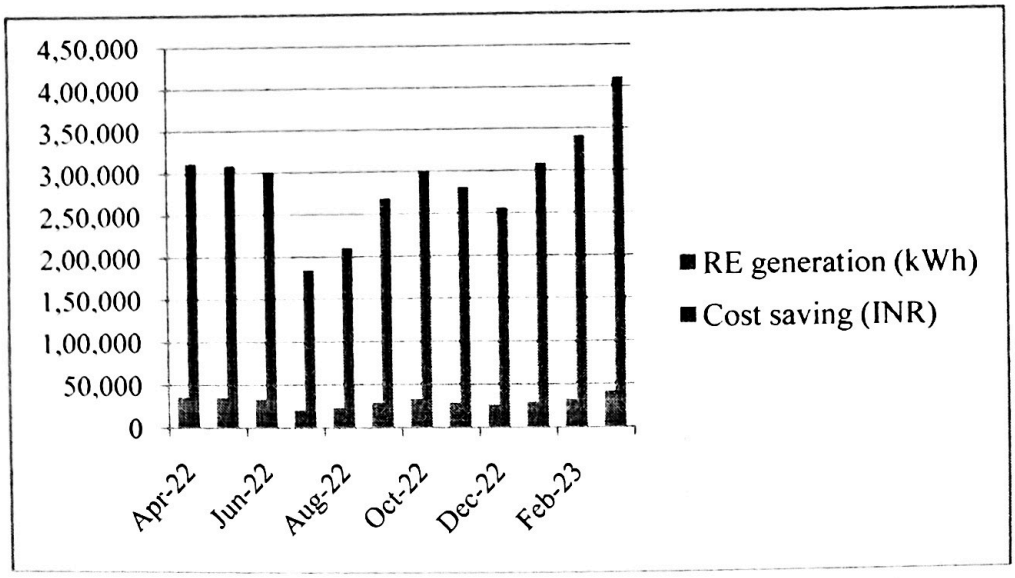

Fig. 2: Solar PV Power generation and associated cost saving

Table 5: Solar PV generation and associated cost saving

Sr. No.	Billing Month	RE generation (kWh)	Total Electricity Consumption (kWh)	Effective unit electricity cost (INR)	Cost saving (INR)
1	Apr-22	36,176	1,31,681	8.62	3,11,837
2	May-22	35,568	1,38,424	8.68	3,08,730
3	Jun-22	33,642	1,39,783	8.94	3,00,759
4	Jul-22	20,784	1,54,323	8.87	1,84,354
5	Aug-22	23,264	1,46,969	9.05	2,10,539
6	Sep-22	29,568	1,46,065	9.08	2,68,477
7	Oct-22	33,664	1,55,375	8.87	2,98,600
8	Nov-22	28,864	91,664	9.74	2,81,135
9	Dec-22	26,432	95,057	9.69	2,56,126
10	Jan-23	30,064	76,331	10.27	3,08,757
11	Feb-23	32,576	71,931	10.49	3,41,722
12	Mar-23	41,648	99,575	9.86	4,10,649
Total for Year 2022-23		**3,72,250**	**14,47,178**		**34,81,687**

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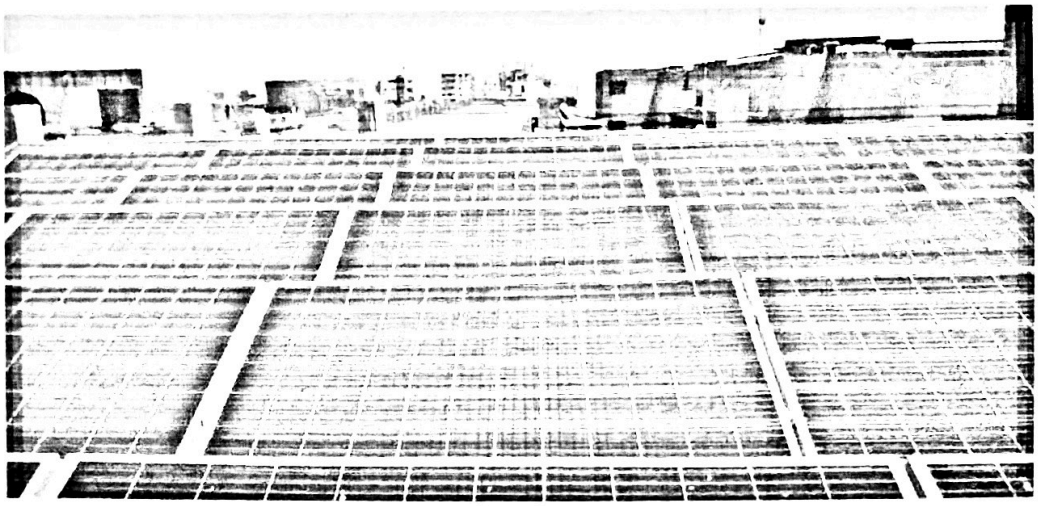
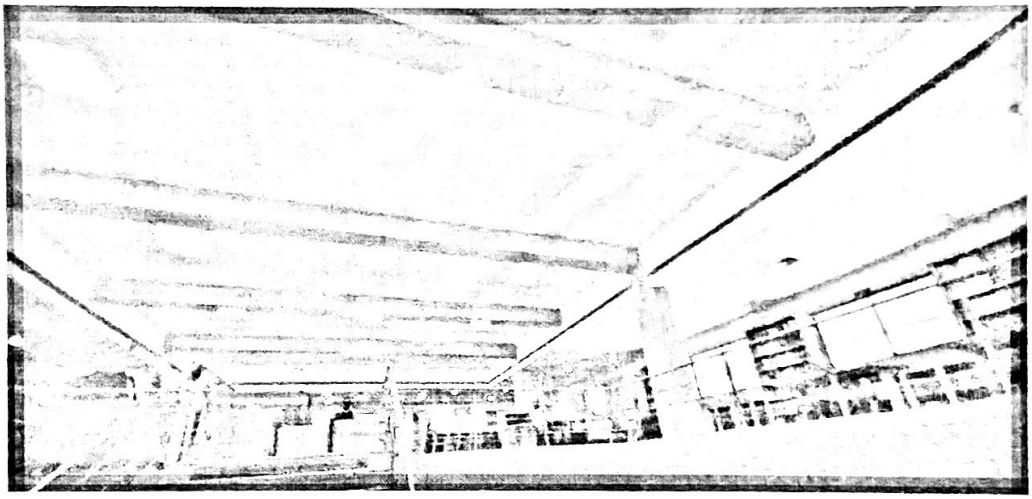
8. Steps taken for Energy Conservation

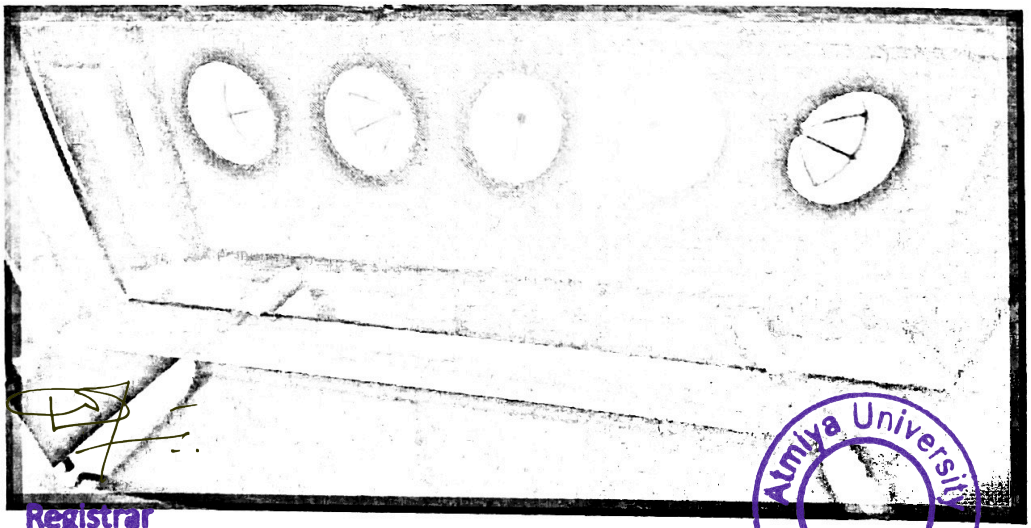
A) Solar PV Power Generation



B) Lighting through LED lights



C) Use of Natural Lights through Sun Roofs



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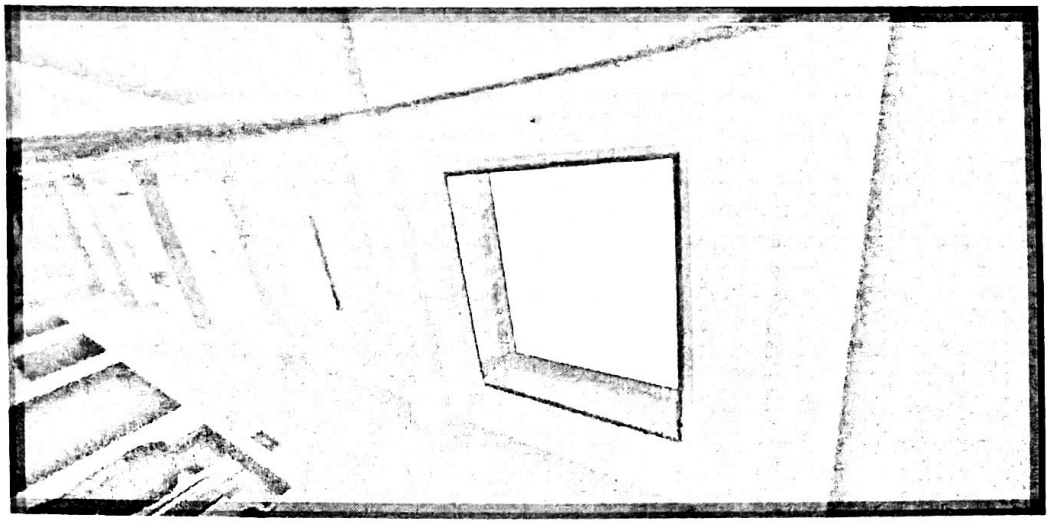
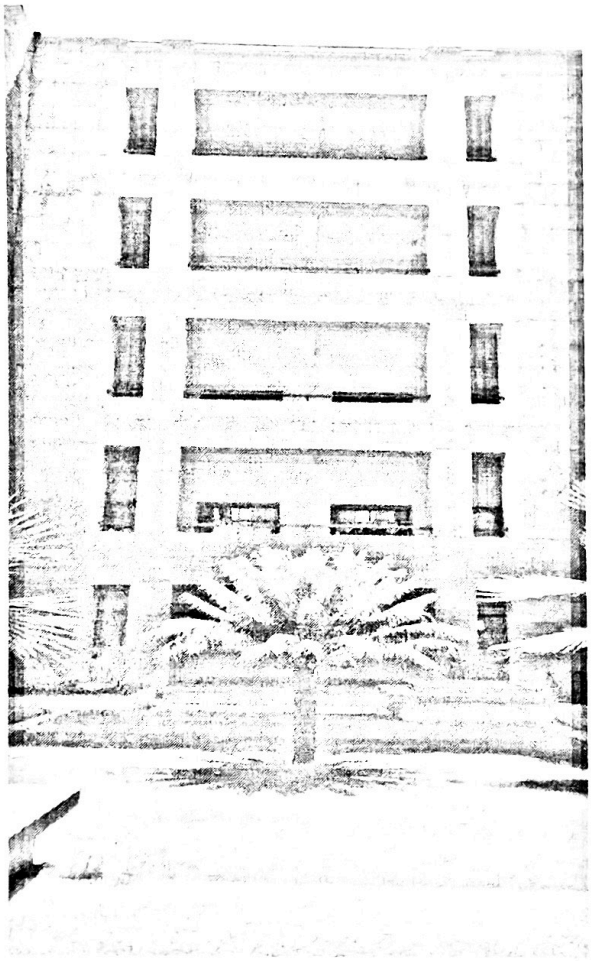


D) Use of Natural Ventilation



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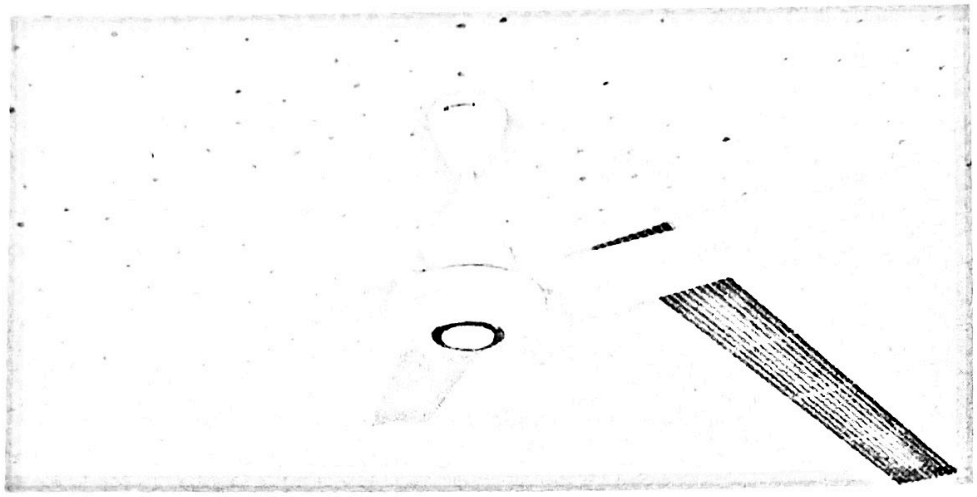
E) Installation of BLDC fans in new building



F) Power factor is maintained nearly at 0.999, which is quite appreciable.

9. Recommendations for Improving Energy Efficiency and Energy Conservation in the Organization

A) There is great power saving opportunities by using automation tools.

- ✓ In toilets, motion sensors can be used to switch on the lights when occupancy is there and to switch off the lights when occupancy is not there. This can reduce toilet Electrical load by much extent.
- ✓ Considering 120 toilet blocks with 2 no. of 22 Watt tube lights,
- ✓ Approx. power consumption per year is 106*120 = 12,720kWh.
- ✓ Considering unit charges in peak hours INR 5.05,
- ✓ Running Cost per year is INR 535*120 = INR 64,200
- ✓ If motion sensor is installed, Running cost per year is INR 66*120 = INR7,920
- ✓ Cost saving on Electricity charges = 64,200-7,920 = INR 56,280
- ✓ Cost of installation of motion sensor is INR 700*120 = INR 84000
- ✓ **Capital cost recovery time = 84,000/56,280 = 1.49 year**

B) All the corridors of the building are highly illuminated during all working hours INR As an automation tool, dimmable lights with sensors may be used for energy conservation.

Considering 11 LEDs of 12 Watt working 10 hours in a day, for each corridor illumination

- ✓ Approx. power consumption per year for a corridor is 12*11*10*300 = 396kWh.
- ✓ Running Cost per year is INR 5.05*396 = INR 2,000
- ✓ If dimmable lights are installed,

  Running cost per year is (12*11*2*300) + (3*11*8*300) = INR158.4*5.05 = INR 800

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- ✓ Cost saving of Electricity = 2,000-800 = INR 1,200
- ✓ Cost of installation of dimmable lights is INR 715*11 = INR 7,865
- ✓ **Capital cost recovery time = 7,865/1,200= 6.5 year**

C) Time independent works like all water tank filling must be encouraged during time interval of 10 pm to 6 am. This will fetch night usage concession and Electricity units consumed in this interval will be charged at **INR 3.77 per unit**.

D) Also, time independent activities must avoid during peak time intervals 7am to 11am and 6pm to 10pm. The power usage in these intervals will be charged at **INR 5.05 per unit**.

E) Power saving boards must be displayed at multiple locations.

F) Energy conservation awareness programs may be conducted in the campus for creating better usage of Electricity.

G) Currently, few Fluorescent lights are in use in the campus. These lights must be replaced by LED lights earliest.

H) Major proportion of fans are of conventional type (50 W).
Approx. power consumption per year for a conventional fan is 50*8*300 = 120 kWh.
Running Cost per year per fan is INR 5.05*120 = INR 606
If BLDC fans of 28 W are installed,
Running cost per year per fan is 28*8*300 = INR67.2*5.05 = INR 339
Cost saving of Electricity per fan = 606-339 = INR 267
Cost of installation BLDC fan = INR 3300
Capital cost recovery time = 3300/267 = 12 year
Hence, in case of need of replacement of fans, conventional fans must be replaced by BLDC fans only.

Prepared By:

14.04.23

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